



# Maui Water Use and Development Plan Update

## ***Commission on Water Resource Management Briefing***

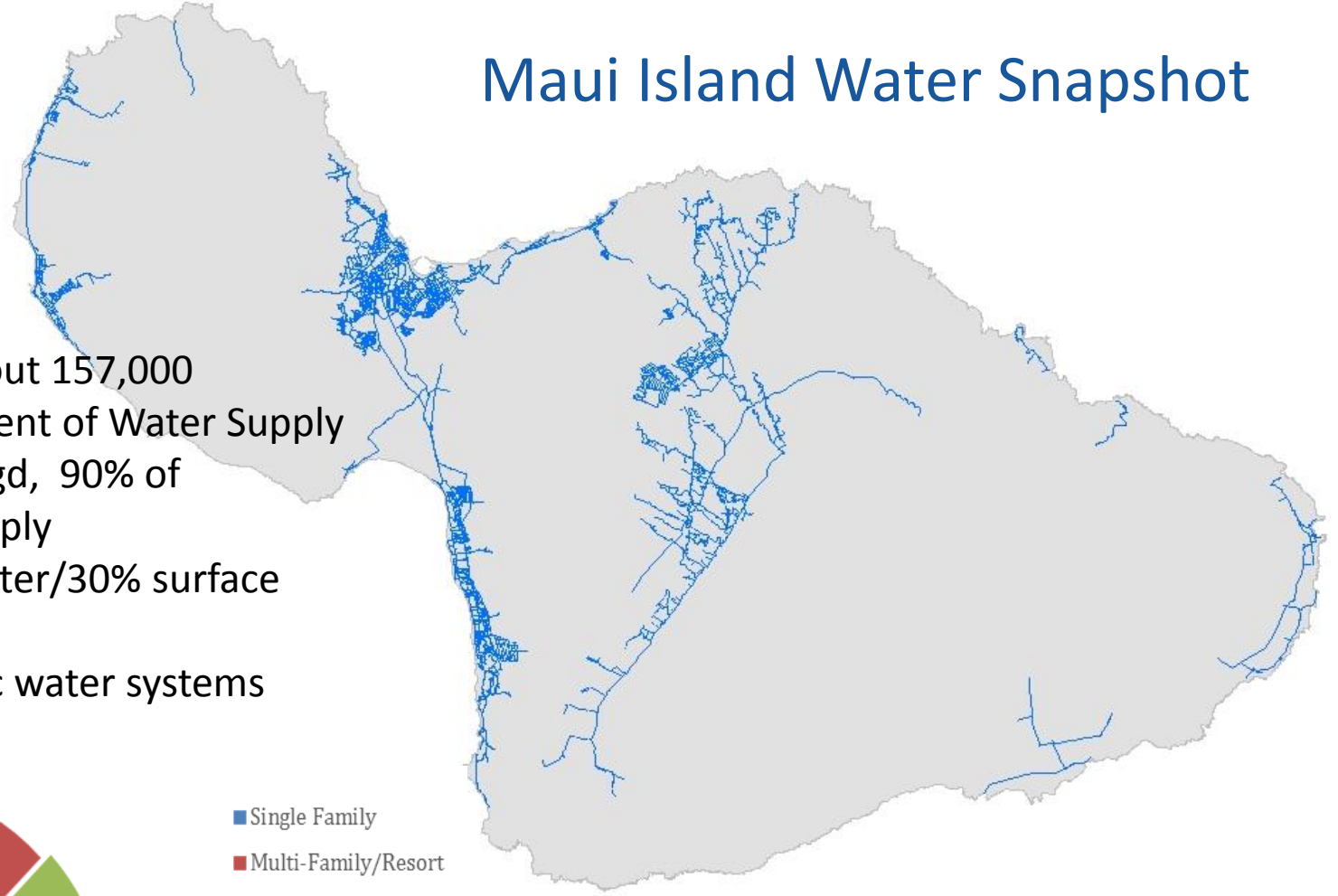
June 20, 2017  
Maui County Department of Water Supply

OLA NĀ MEA A PAU I KA WAI  
*By Water All Things Find Life*

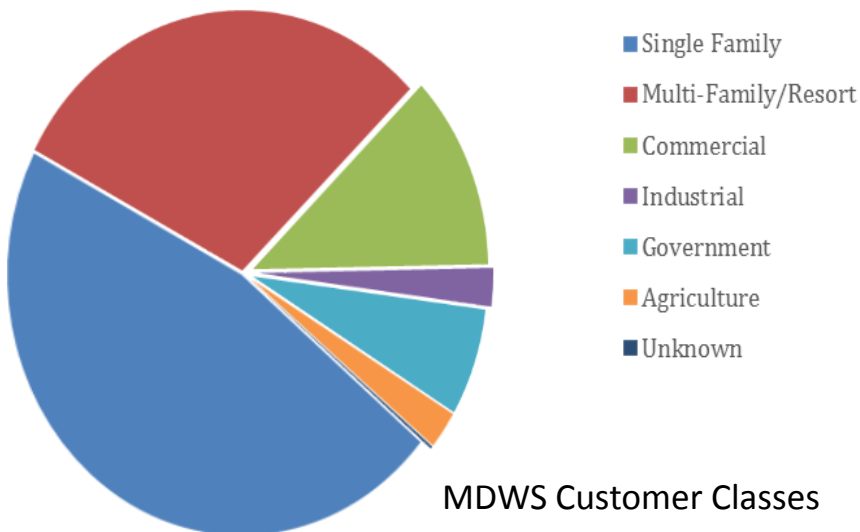
# Presentation Outline

- Status & Timeline
- Public Process
- Part I: Introduction and Technical Approach
- Part II: Island Wide Water Resource Management, Strategies and Recommendations
- What's Next

# Maui Island Water Snapshot



- Population about 157,000
- Maui Department of Water Supply provides 36 mgd, 90% of freshwater supply
- 70% groundwater/30% surface water
- 11 other public water systems



- Until the end of 2016: 90 % of water use for agricultural irrigation, most from surface water sources
- About 44,400 acres were in ag cultivation, >80% in sugarcane

# Background and Timeline

## Maui Island

WUDP public process reignited

Public meetings, Targeted Stakeholder Meetings

Public Workshops.....

Brief CWRM/Board of Water Supply.....

3<sup>rd</sup> Round Public Meetings Preliminary Strategies

Draft Plan Sections & Brief Board of Water Supply

**Board of Water Supply Review/Public Hearings**

County Council/CWRM Final Plan Approval.....

## Moloka'i

Commence process.....

Winter/Spring 2016

Spring 2016

Spring/Summer 2016

Summer 2016

Fall/Winter 2016

Spring 2017

Summer /Fall 2017

Fall/Winter 2017

2018

# Part I: Introduction and Technical Approach

## Content

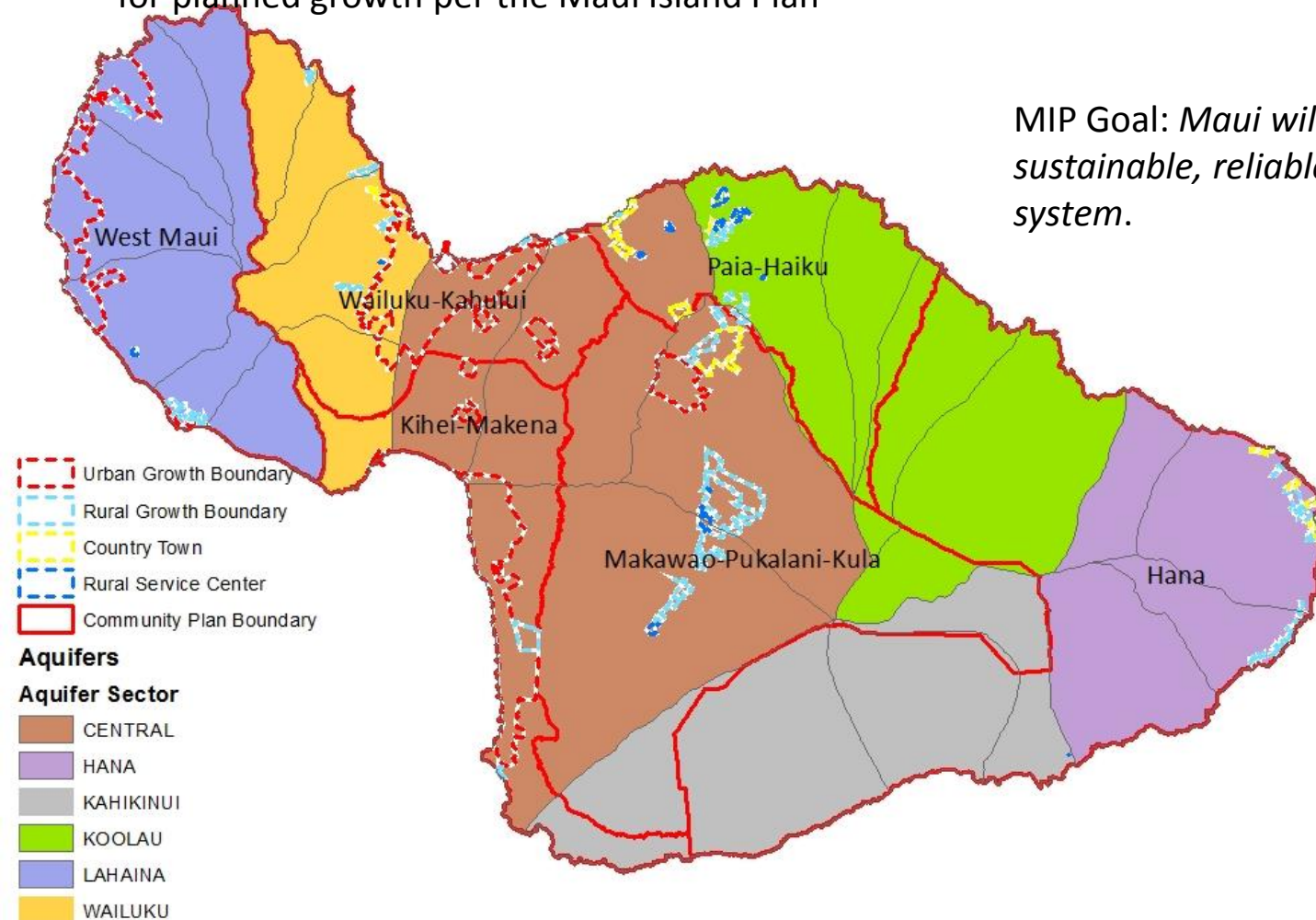
1. Regulatory Framework: State, County and other policy plans
2. Integrated Planning Process: Community interests and participation
3. Management Framework: Issues and concerns, values and principles, planning objectives
4. Planning Scenarios: Alternative scenarios to project demand and account for uncertainties
5. Physical Setting: Water resources, hydrology, drought and climate change effects, water resource availability
6. Settlement patterns and cultural resources
7. Existing Land Use: Maui Island Plan, Department of Hawaiian Homelands Plan
8. Existing Water Use: By type and resource, alternative water resources
9. Future Water Needs: Demand projections based on land use and population growth, agricultural, DHHL and drought scenarios



# Part I: Regulatory Framework

- Consistent with Maui General Plan, Community Plans, DHHL
- Long range strategic water resource plan to inform and guide the DWS capital improvement program
- Applies to DWS and other county agencies, privately owned public water systems
- Set forth allocation of water to land use by identifying water supplies (and conservation strategies) for planned growth per the Maui Island Plan

*MIP Goal: Maui will have an environmentally sustainable, reliable, safe, and efficient water system.*



# Part I: Integrated Planning Process/Community Participation

2004 - 2009: Limited scope:  
DWS Central and Upcountry  
districts

2012: Revised Project  
Description accepted by CWRM

2013: Initial round of community  
meetings



2016 - 2017:

- Regional community meetings (12): Round 1 - Issue identification, Round 2 – Profiles, Objectives and Strategies, and Round 3 – Strategies to Address the Key Issues
- Target interest group meetings (7): Group of diverse interests, Aha Moku O Maui and regional moku, agricultural, realtors, Kaupo community.
- Ka Pa'akai consultation process
- WUDP Survey distributed at meetings and online
- All materials placed online
- Progress reports provided to the Board of Water Supply (2), the Council's Water Resources Committee (2), and CWRM (2)

# Part I: Management Framework

## Issues and Concerns:

- Impacts of water transport from wet areas on the ecosystem and public trust and other local uses
- Streamflow diversions have abused water rights
- Conventional landscaping is an irresponsible use of water resources
- Lack of aquifer information in regions that are not designated groundwater management areas
- Availability of water for affordable housing, farming, residential and business use
- Concern for brackish wells becoming saltier
- Disrepair and maintenance of plantation conveyance and irrigation systems
- Inadequate reporting of private wells
- Impact on water resource from extended droughts

## Values and Principles

- Ecologically holistic and sustainable
- Based on ahupua'a management principles
- Legal, science and community-based
- Action-oriented

## Planning Objectives

- ✓ Maintain Sustainable Resources
- ✓ Protect Water Resources
- ✓ Protect and Restore Streams
- ✓ Minimize Adverse Environmental Impacts
- ✓ Manage Water Equitably
- ✓ Provide for Department of Hawaiian Homelands Needs
- ✓ Provide for Agricultural Needs
- ✓ Protect Cultural Resources
- ✓ Provide Adequate Volume of Water Supply
- ✓ Maximize Water Quality
- ✓ Maximize Reliability of Water Service
- ✓ Maximize Efficiency of Water Use
- ✓ Minimize Cost of Water Supply
- ✓ Establish Viable Plans
- ✓ Maintain Consistency with General and Community Plans



# Part I: Management Framework

Criteria	Planning Objectives							
	Sustainability Resources Streams Environment	Ag	Equity DHHL Culture	Availability	Quality	Reliability	Efficiency Cost	Plan Viability Conformity
Groundwater sustainable yield levels are maintained over time	X			X				X
Stream flows restored to level to support stream ecosystems	X		X	X				X
Watersheds protected from invasive animals and plants	X			X				
Interim flow standards adopted for watersheds	X		X					
Scientific studies for aquifer systems complete (support science-based SY)	X							
Water resources and water system use is based on aquifer recharge and stream flows under drought conditions	X		X		X	X		
Chloride levels in wells remain stable (salt water intrusion)	X	X		X	X	X	X	
Use of recycled water increased	X			X		X		
Graywater and catchment systems installed	X			X				
Infrastructure projects increase recycled water use and stormwater capture	X			X				
Watershed collaboration increased	X			X				X
Native Hawaiian community consultation process instituted			X					X
Per capita water use decreased	X			X		X	X	
MDWS prioritize DHHL needs over lower priority needs			X					

# Part I: Planning Scenarios

Evaluate future water resources and demands over the planning horizon 2015-2035

**Population Based Water Demand Scenario:** Based on the population growth rates by community plan area in the Maui Island Plan (2014 Socio-Economic Forecast Update). Excluding agricultural demands which are not correlated with population growth. High and Low Cases are generated based on Socio-Economic Forecast.

**Land Use Full Build Out Scenario:** An alternative scenario projects water demand based on full development of the County General Plan, County Zoning and DHHL land use plans over an undetermined period

**Drought and Climate Change:** Impact on stream base flows, recharge and salinity. Uncertainty make regional and long-term predictions very complex. *Climate Change Adaptation Priority Guidelines* incorporated to increase resilience and reduce vulnerability to risks related to climate change.

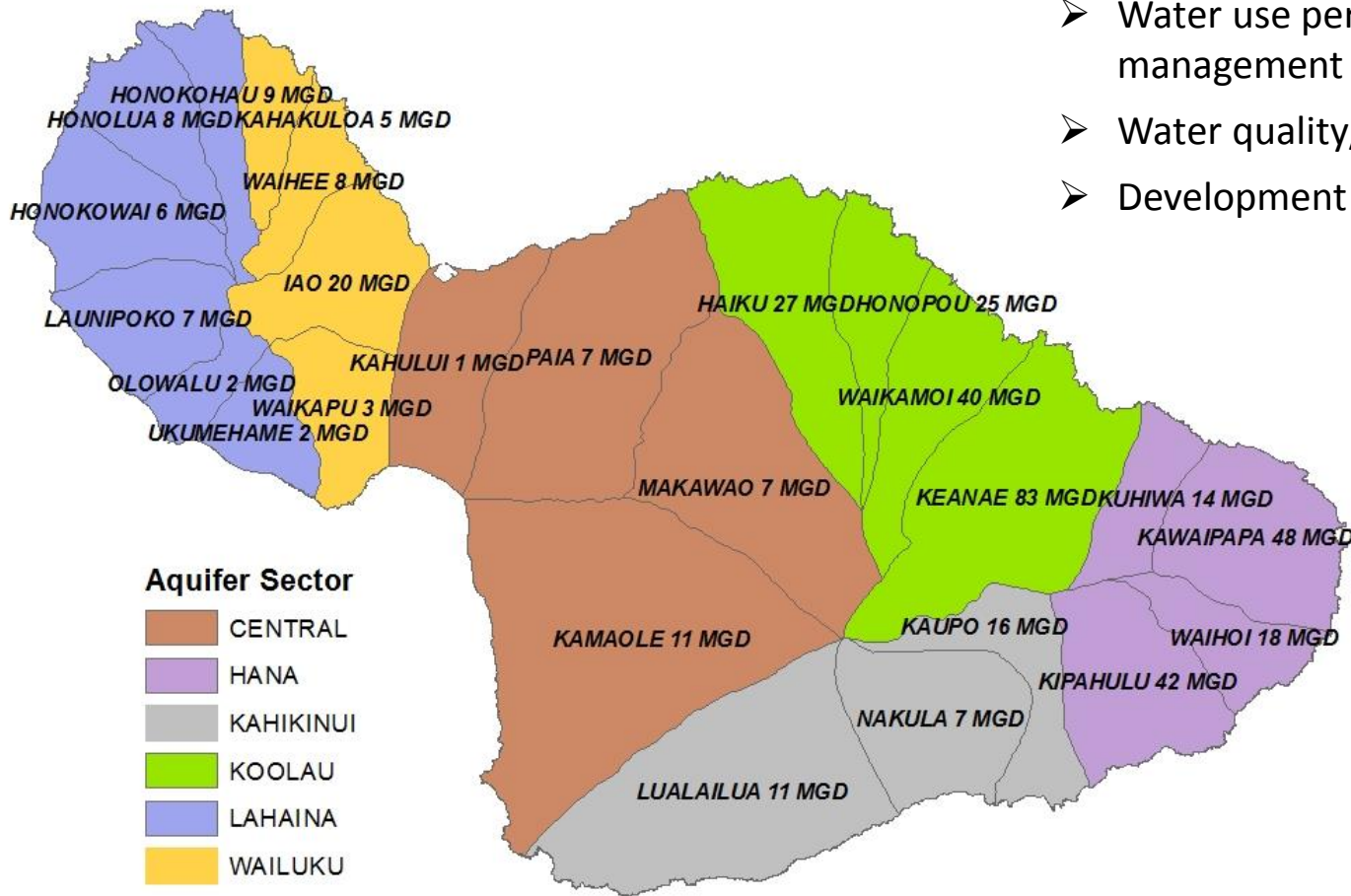
**Agricultural Water Demand Scenario:** Uncertainty about agricultural products market and regional crop water demand, the transition of sugarcane lands to other crops, potential future use of kuleana lands, and associated legal issues relating to water rights and priorities of use. Scenarios rely on stated assumptions and best data available. Added as a separate component for a comprehensive assessment of water demands.

# Part I: Physical Setting

## Groundwater Availability

- Sustainable yield of basal aquifers represents the maximum aquifer pumping rate assuming optimal placement of wells and pump sizes
- Drought conditions significantly impact recharge compared to average climate conditions, with a projected mean 23% decrease in annual recharge
- Withdrawals are also limited by:

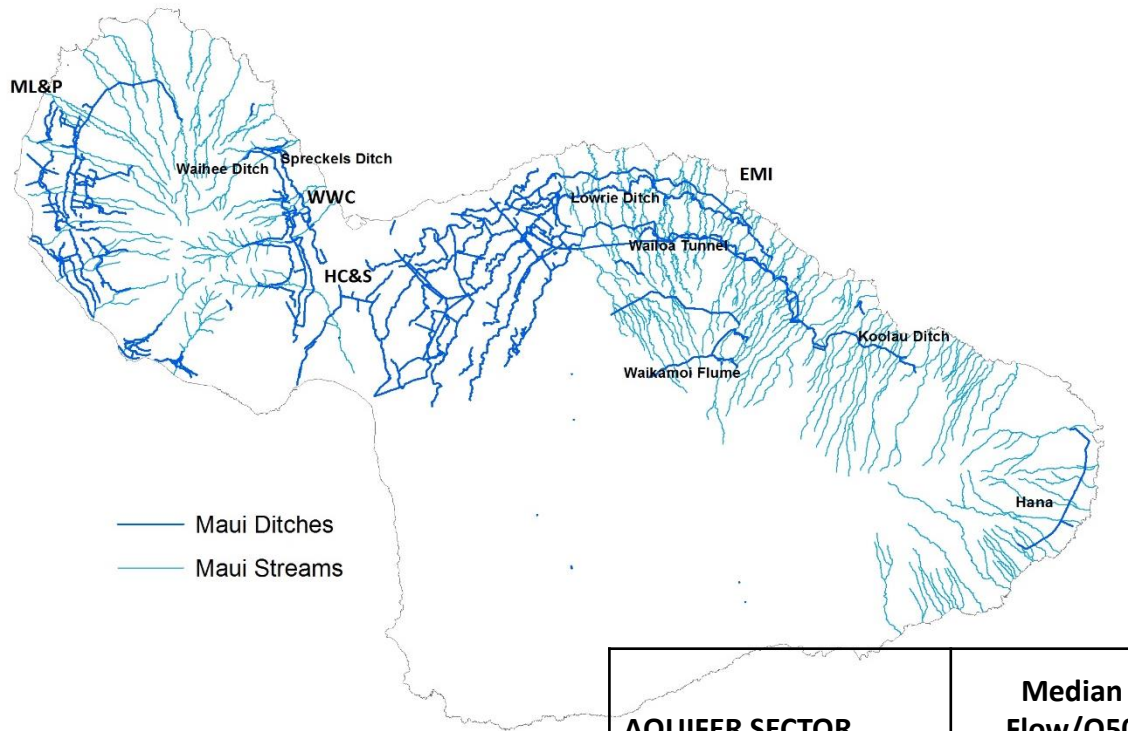
- Water use permit allocations in water management areas
- Water quality/groundwater contamination
- Development cost and risk



Aquifer Sector	2008 SY	Drought Recharge Reduction
Wailuku	36	29%
Lahaina	34	24%
Central	26	25%
Ko'olau	175	21%
Hāna	122	19%
Kahikinui	34	37%
Total	427	

# Part I: Physical Setting

## Surface Water Availability



- There are 90 perennial streams in Maui, 82 of which have been diverted to some extent
- 90% of use is agricultural
- Availability is uncertain due to lack of numerical instream flow standards, lack of gages, reporting and legal issues.
- CWRM's mandate is to establish instream flow standards that will protect instream uses while allowing for reasonable and beneficial offstream use

AQUIFER SECTOR	Median Flow/Q50	Low Q70	Drought Flow/Q90	Potential IFS
WAILUKU	67.83 <sup>b</sup>	51.7 <sup>b</sup>	40.2 <sup>b</sup>	N/A
Na Wai Eha	62.66	48.69	37.34	35.4 <sup>c</sup>
KO`OLAU	59.7	35.72	20.23	N/A
East Maui Streams CCH	44.17	25.17	14.45	39.99 <sup>d</sup>
LAHAINA	40	31	22.44	
CENTRAL	0	0	0	0
HANA	N/A	N/A	N/A	N/A
KAHIKINUI	N/A	N/A	N/A	N/A
MAUI ISLAND	169.18	119.74	84.24	

b. USGS 2016-5103

c. CWRM 2010 decision

d. CWRM Hearing Officer Decision 1/15/16



# Part I: Physical Setting:

## Alternative Water Resources

### Recycled Wastewater

WWRF	Treatment Level	WWRF Design Capacity	Recycled Water Produced	Recycled Water Used	% of Total Produced Used	% of Design Capacity Used	Application
Wailuku-Kahului	R-2	7.9	4.7	0.25	5.3%	3.2%	None
Kihei	R-1	8	3.6	1.5	41.5%	18.7%	Golf Course, Ag, Dust Control, Landscape, Fire Protection
Makena (Private)	R-1	0.75	0.08	0.08	10.6%	10.6%	Golf Course
Pukalani (Private)	R-1	0.29	0.19	0.19	100%	65.5%	Landscape
Haleakalā (Private)		N/A	0.18	N/A	N/A	N/A	Closed loop system; Sanitary purposes
Lahaina	R-1	9	3.84	0.88	22.9%	9.8%	Golf Course, Landscape, Nursery, Agriculture
<b>Total</b>		<b>25.9</b>	<b>12.6</b>	<b>2.65</b>			

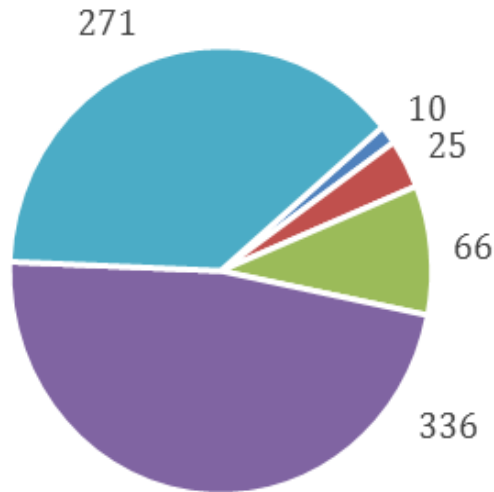
**Rainwater Catchment:** Feasible where consistent rainfall

**Stormwater Reuse :** Capture and reuse of surface water runoff for non potable use. Range in technologies: source reuse (ex. rain barrels and cisterns); small lot reuse (ex. vegetated infiltration basins), stormwater capture (injection well), stormwater storage (ex. detention basin), stormwater distribution (ex. ditch or pipe network)

**Desalination:** Seawater, brackish water or treated wastewater can be processed through several desalination methods. Brine disposal and cost are issues

# Part I: Existing Water Use:

## 2014 Water Use By Resource (mgd)



■ MDWS Surface Water    ■ MDWS Groundwater    ■ Groundwater  
■ Untapped Groundwater    ■ Surface Water

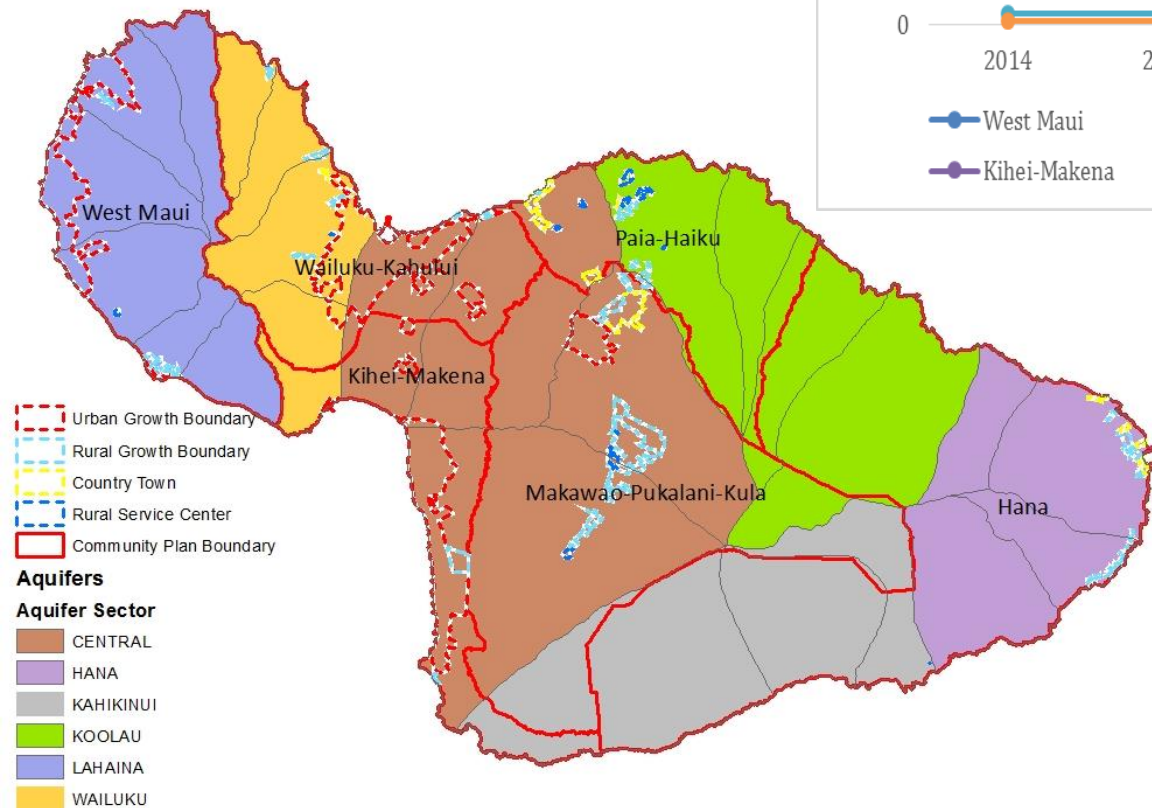
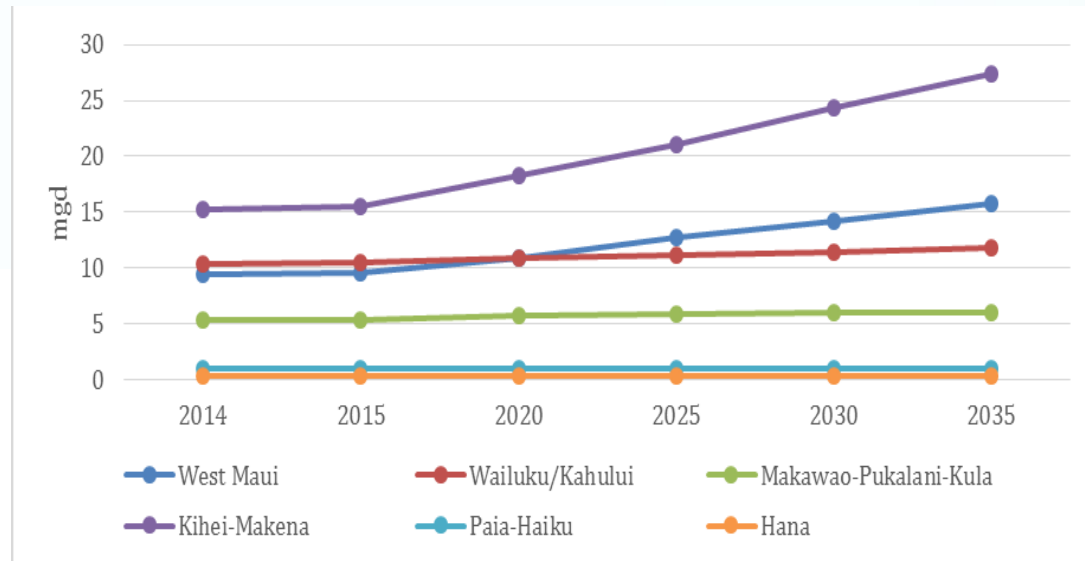
AQUIFER SECTOR	2009 – 2015 Average Diverted	1990 and Prior Diverted <sup>a</sup>	2014 Adjusted Use
WAILUKU	41-60	107.3	
Na Wai Eha	41-60	107.3	76
KO`OLAU	114-167	169.6	167 - 175
LAHAINA	20.21	56.2	20
CENTRAL	0	0	
HANA	N/A	0.1	
KAHIKINUI	N/A	0.1	
MAUI ISLAND	175.21 - 247.21	333.3	263 - 271

Resource	Available	Used	Balance
GROUNDWATER	427 SY	91	336
Potable Uses		29	
Nonpotable Uses		62	
SURFACE WATER	Undetermined	271	
Potable Uses		11	
Nonpotable Uses		260	
ALTERNATIVE SOURCES	26	3	
Recycled	26	3	23
Other Nonpotable			

# Part I: Future Water Needs

## Population Growth Based Demand

**Demand by Community Plan Area, 2014- 2035 (mgd)**



# Part I: Future Water Needs:

## Agricultural Demand

Agricultural Use	Total MGD
Kuleana/Lo'i Kalo	10.89 – 15.52
Department of Hawaiian Homelands	31
Diversified Ag	20.86 – 25.0
HC&S lands	22.5 – 124.45

**Kuleana/Lo'i Kalo:** Range based on 2015 Ag Baseline and CWRM IIFS proceedings. Accounts for stream taro use

**DHHL:** DHHL's regional and island plans. Non potable demands for ag and pastoral use.

**Diversified Ag:** Range based on 2015 Ag Baseline and 20% increase, includes Kula Ag Park Expansion. Not including sugarcane and taro

**HC&S lands:** Range based on low to high scenarios: low: 25% of Important Ag Lands farmed; high: 100% of Important Ag Lands farmed. (HC&S "Diversified Agricultural Plan", 100% of plantation acreage represents 107.79 mgd)



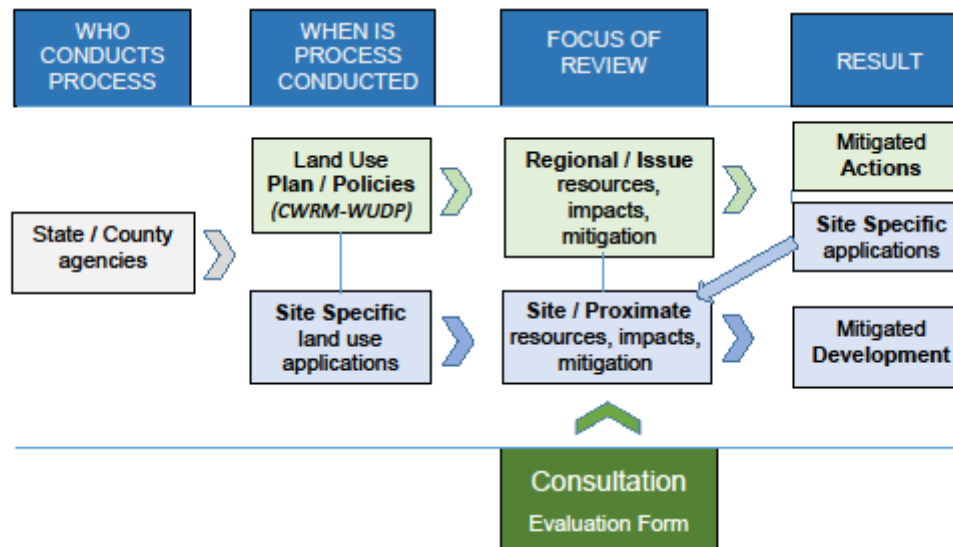
# Part II: Water Resource Management, Strategies and Recommendations

## Content

- 10. Relation to Management Framework: Ka Pa'akai analysis, water supply sustainability and quality
- 11. Water Resource Adequacy: Resource availability and uncertainties
- 12. Strategies: Resource management, conservation, conventional and alternative water sources, land use controls
- 13. Summary of Recommendations: Planning objective conflicts, recommended tradeoffs, implementation and funding

## Part II: Ka Paʻakai Analysis

- Supreme Court Ka Paʻakai O Ka ʻAina v. Land Use Commission: Agencies to protect native Hawaiian customary and traditional practices to the extent feasible.
- WUDP proposed uses of water resources accompanied by inquiries into the impacts on traditional and customary rights to ensure that proposed water resource uses are pursued in a culturally appropriate way.
- Matrix (appendix 10) briefly assesses and summarizes how each preliminary strategy may relate to protection of valued resources including traditional and customary native Hawaiian rights, including mitigation measures



Maui County Department of Water Supply,  
Water Resources & Planning, April 2017

## Part II: Ka Paʻakai Analysis

- **“Petition” or impacted area** ... Maui Island - areas affected by proposed WUDP strategies, policies, actions
- **Cultural practices** ... may extend to traditions, beliefs, practices, life ways, and societal history of a community and its traditions, arts, crafts, music, medicine, religion and related institutions
- **Pre-contact native Hawaiian population concentrated around streams and nearshore resources** within the larger ahupua`a system
- **Contemporary resources and practices tend to be located in similar areas.**
- **Presently valued resources and cultural practices** may be affected by distant population centers and varied uses which transport water from culturally intensive and sensitive areas
- **No “standard” source** of valued cultural and historical or natural resources and potential native Hawaiian traditional and customary practices – review of existing info and consultations with knowledgeable persons and organizations are important



# Part II: Ka Paʻakai Analysis

## Organizations Contacted

- 
- Aha Moku Maui Advisory Committee
  - Department of Hawaiian Homelands (DHHL)
  - Office of Hawaiian Affairs (OHA)
  - Hawaiian Homes Commission
  - State of Hawaiʻi Office of Historic Preservation
  - County of Maui Planning Department
  - State of Hawaiʻi Office of Planning
  - State of Hawaiʻi Commission on Water Resource Management
  - State of Hawaiʻi Historic Preservation Division
  - Native Hawaiian Legal Corporation
  - Maui Hawaiian Civic Clubs
  - Native Hawaiian Organizations Association
  - Earth Justice
  - Hui o Na Wai ʻEha
  - Maui Tomorrow
  - Kamehameha Schools
  - University of Maui Hawaiian Studies Department
  - University of Hawaii at Manoa Hawaiian Studies Department
  - Ka Huli Ao Center for Excellence in Native Hawaiian Law at the University of Hawaii's William S. Richardson School of Law
  - University of Hawaii Environmental Center
  - Ka Piko O Ka Naʻauao The Hawaiian Learning Center, Kumu Hula & Cultural Specialist
  - Halau Hula Malani O Kapehe
  - Halau Hula Kauluokala
  - Halau Kekuaokalaʻauʻalaʻiliahi
  - Halau Na Lei Kaumaka O Uka
  - Hula Alapaʻi I Maluuluolele
  - Halau Keʻalaokamaile



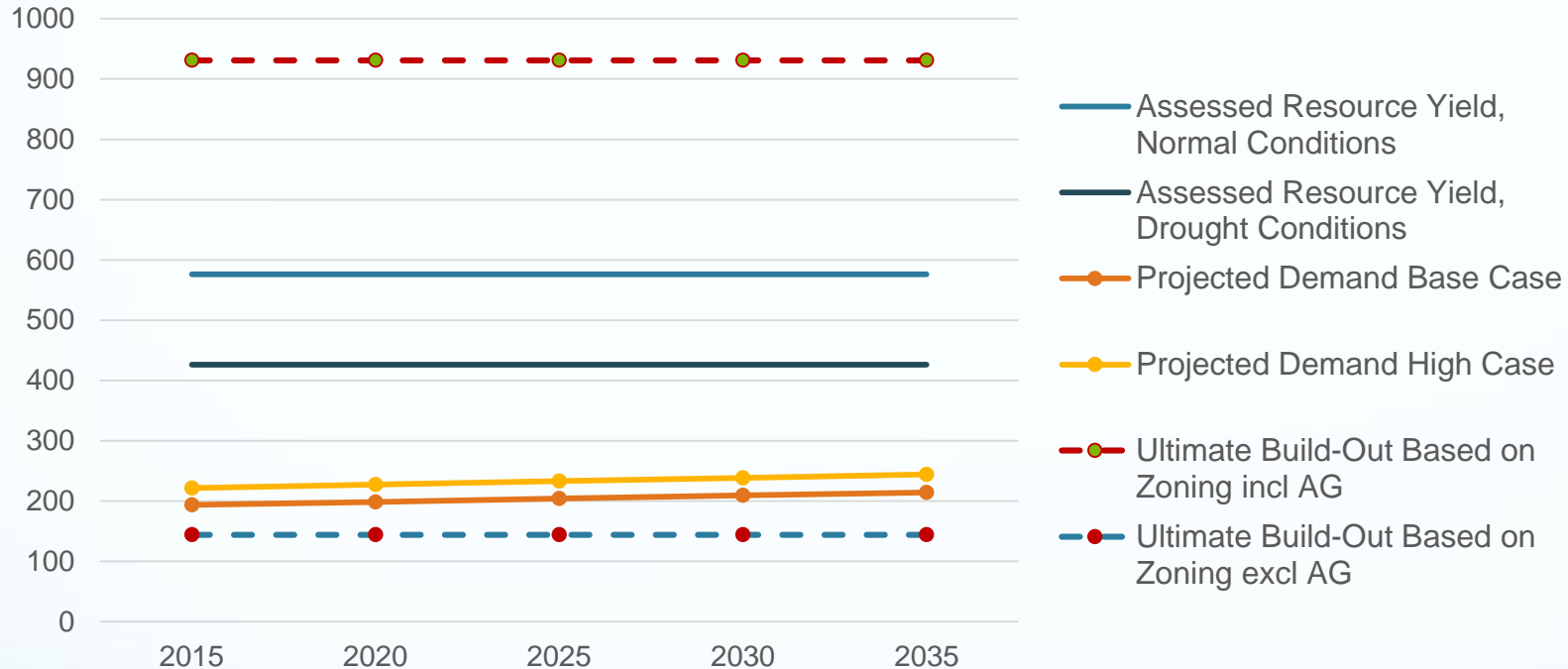
# Part II: Ka Pa`akai Analysis

## from Strategies to Implementation

- WUDP focuses on general, regional strategies - not location specific  
Ka Pa`akai analysis of WUDP strategies:
  - Opportunity to holistically identify, evaluate and mitigate potential impacts at earliest time possible
  - Comprehensively address regional or island wide issues not effectively addressed at project level (watersheds, streamflow, etc.)
- Future implementation of strategies in WUDP: regulatory changes, source or system infrastructure development, etc.
  - Some actions may require a future Ka Pa`akai analysis via environmental assessment
  - WUDP suggest mitigation to be applied at development permit stage

# Part II: Resource Adequacy

## Assessed Resource Yield and Projected Demand



Aquifer Sector	Sustainable Yield		Pumpage (2014 Average)	% of Aquifer Pumped
Wailuku	36		20.761	58%
Lahaina	34		6.207	18%
Central	26		62.724	241%
Ko'olau	175		0.916	1%
Hāna	122		0.606	0%
Kahikinui	34		0	0%
Total	427		91.214	21%

# Part II: Strategies

- 62 island wide strategies and policies derived from preliminary strategies vetted throughout the public process:
  - Address identified issues and concerns
  - Meet one or several established planning objectives
  - Reflect the values and guiding principles
  - Feasible considering hydrologic and legal constraints
  - Cost effective to adequately meet projected demand
- Comparative costs over a 20 year life cycle are assessed or estimated in order to compare and roughly characterize conceptual resource strategies.
- Regional Plans articulate region specific issues, sub-objectives and strategies
- Recommendations include policies and actions that on a county level should provide the foundation and guidance for MDWS capital improvement program and budget, public/private partnerships, studies and land use decisions.
- On a state level, recommendations should provide guidance to the CWRM in their decisions regarding pumping permits, stream withdrawals, water reservations and other matters.

# Part II: Strategies

## Resource Management

### **Watershed protection:**

- Continue and increase financial support for watershed management partnerships' fencing and weed eradication efforts
- Promote increased distribution of funding and active reforestation
- Support increased use of kalo lands
- Enable and assist in providing for Native Hawaiian water rights, cultural and traditional uses through active consultation and participation



### **Water quality management:**

- Implement well siting criteria to avoid contaminated groundwater supplies and unnecessary risks to public health
- Adopt wellhead protection measures for potable wells
- Update assessment of potential contaminating activities around drinking water supply and support increased monitoring of potable wells as needed



# Part II: Strategies

## Conservation

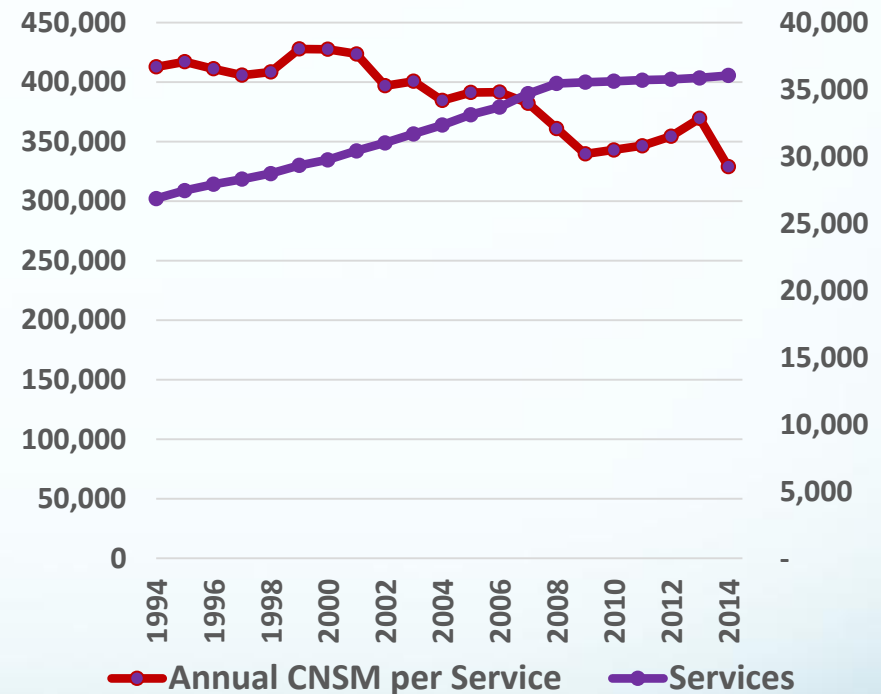
### Demand side measures:

- Retrofits/direct installation programs, distribution of water-efficient fixtures and retrofits for existing users and facilities
- Landscaping and irrigation system incentives, targeting dry areas.
- Revise county code to require high efficiency fixtures in all new construction. Develop a comprehensive water conservation ordinance to include xeriscaping regulations
- Agricultural programs: Irrigation efficiency audits, technical assistance and rebates. Ag technical working groups.

### Supply side measures:

- Improve irrigation management and efficiency
- Maintain the integrity of plantation irrigation systems including reservoirs
- Augment agricultural water supplies with alternative resources
- Pursue comprehensive energy management

**DWS METERS AND DEMAND**  
**Maui Island 1994-2014**



# Part II: Strategies

## Conventional Water Source

- Support collaborative hydrogeological studies to inform impact from climate change and future well development on groundwater health.
- Develop groundwater within sustainable yield to provide sufficient supply for growth, maintaining a buffer to account for potential future drought impact and prospective adjustments in aquifers lacking hydrologic studies.
- Protect and prioritize public trust uses in allocating groundwater in regions of limited resources and conflicting needs.
- Formalize demand response plans for water purveyors that address water shortage and aquifer changes.
- Develop groundwater to maximize reliability of potable supply and as contingency in areas currently dependent on surface water.
- Prioritize delivery and use of agricultural water within County agricultural parks to cultivation of food crops for local consumption

## Alternative Water Source

- Expand requirement for new development to connect to recycled water infrastructure if practical
- Inform and educate the residential and commercial community of easy, affordable rainfall catchment for recharge and garden use
- Explore and promote opportunities for large volume stormwater runoff for agricultural irrigation.



# Part II: Implementation and Funding

## **Integrate land and water use:**

- Formulation of the WUDP incorporates General Plan data, resources and coordinates with the County Long Range Planning
- Allocates water to land use by identifying water resource strategies to meet planned growth in the Maui Island Plan
- In turn, WUDP projections, policies and strategies inform the Community Plan updates and future general plan amendments.

## **Implementation Process**

- Implementing actions to effectuate the intent of the policies and strategies should be developed over the twenty-year planning period.
- Identifies agencies and organizations tasked with scoping and refining strategies into projects
- Estimated timeframes for implementation allow for flexibility to re-scope, prioritize and adjust to available funding.

## **Funding**

- Primarily shared between state and county agencies, with the greatest burden on MDWS
- Major MDWS capital improvements for conventional resource strategies assessed in the MIP to meet projected demand to year 2030 have not changed significantly

# What's next?

W

- Refined regional water supply strategies (Sector Reports)
- Board of Water Supply - review and recommend revisions

U

- County Council - Adoption by Ordinance
- 180 days

D

- State Commission on Water Resource Management - Approval

P

- Implementation: The plan goals and objectives are achieved if the adopted policies and strategies are pursued

<http://co.maui.hi.us/2051/Maui-Island-Water-Use-Development-Plan>

**Mahalo!**